Guidelines for the Prevention and Treatment of Opportunistic Infections Among HIV-Exposed and HIV-Infected Children

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Table 3: Treatment of Opportunistic Infections in HIV-Exposed and HIV-Infected Children—Summary of Recommendations (Last updated December 15, 2016; last reviewed December 15, 2016) (page 1 of 24)

Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed
Bacterial Infections Bacterial pneumonia *S. pneumoniae*; occasionally *S. aureus*, *H. influenzae*, *P. aeruginosa*	• Ceftriaxone 50–100 mg/kg body weight per dose once daily, or 25–50 mg/kg body weight per dose twice daily IV or IM (max 4 g/day), or • Cefotaxime 40–50 mg/kg body weight per dose 4 times daily, or 50–65 mg/kg body weight 3 times daily (max 8–10 g/day) IV	• Cefuroxime, 35–50 mg/kg body weight per dose 3 times daily(max 4–6 g/day) IV	For children who are receiving effective cART, have mild or no immunosuppression, and have mild to moderate community-acquired pneumonia, oral therapy option would be amoxicillin 45 mg/kg body weight per dose twice daily (maximum dose: 4 g per day). Add azithromycin for hospitalized patients to treat other common community-acquired pneumonia pathogens (*M. pneumoniae*, *C. pneumoniae*). Add clindamycin or vancomycin if methicillin-resistant *S. aureus* is suspected (base the choice on local susceptibility patterns). For patients with neutropenia, chronic lung disease other than asthma (e.g., LIP, bronchiectasis) or indwelling venous catheter, consider regimen that includes activity against *P. aeruginosa* (such as ceftazidime or cefepime instead of ceftriaxone). Consider PCP in patients with severe pneumonia or more advanced HIV disease. Evaluate for tuberculosis, cryptococcosis, and endemic fungi as epidemiology suggests.	November 6, 2013
Candidiasis	Oropharyngeal: • Fluconazole 6–12 mg/kg body weight (max 400 mg/dose) by mouth once daily • Clotrimazole troches 10-mg troche by mouth 4-5 times daily • Nystatin suspension 4–6 mL by mouth 4 times daily or 1–2, 200,000-U flavored pastilles by mouth 4–5 times daily *Treatment Duration:* • 7 to 14 days Esophageal Disease: • Fluconazole 6–12 mg/kg body weight by mouth once daily (maximum dose: 600 mg)	Oropharyngeal (Fluconazole-Refractory): • Itraconazole oral solution 2.5 mg/kg body weight/dose by mouth twice daily (maximum 200–400 mg/day) Esophageal Disease: • Amphotericin B (deoxycholate) 0.3–0.7 g/kg body weight IV once daily *Echinocandins:* • Anidulafungin	Itraconazole oral solution **should not** be used interchangeably with itraconazole capsules. Itraconazole capsules are generally ineffective for treatment of esophageal disease. Central venous catheters should be removed, when feasible, in HIV-infected children with fungemia. In uncomplicated catheter-associated C. albicans candidemia, an initial course of amphotericin B followed by fluconazole to complete treatment can be used (use invasive disease dosing). Voriconazole has been used to treat esophageal candidiasis in a small number of HIV-uninfected immunocompromised children. Voriconazole Dosing in Pediatric Patients: • 9 mg/kg body weight/dose every 12 hours IV loading for day 1, followed by 8 mg/kg body weight/dose IV every 12	November 6, 2013

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Candidiasis, continued	• Itraconazole oral solution, 2.5 mg/kg body weight/dose by mouth twice daily *Treatment Duration:* • Minimum of 3 weeks and for at least 2 weeks following the resolution of symptoms	• Aged 2–17 years, loading dose of 3 mg/kg body weight/ daily and then maintenance at 1.5 mg/kg body weight/dose daily IV • Caspofungin • Infants aged <3 months, 25 mg/m^2 body surface area/dose daily IV • Aged 3 months–17 years, 70 mg/m^2/day IV loading dose followed by 50 mg/m^2/day IV (maximum 70 mg). **Note:** dosing based on surface area is recommended for children for caspofungin. • Aged ≥18 years, 70-mg loading dose IV, then 50 mg/dose daily IV • Micafungin **Note:** In the United States, optimal dosing for children is not yet established, and there is no pediatric indication yet. Studies indicate linear PK; age and clearance are inversely related—see recommended doses below. • Neonates, up to 10–12 mg/kg bodyweight/dose daily IV may be required to achieve therapeutic concentrations. • Infants, <15 kg body weight, 5–7 mg/kg body weight/dose daily IV • Children ≤40 kg body weight and aged 2–8 years, 3–4 mg/kg body weight/dose daily IV • Children ≤40 kg body weight and aged 9–17 years, 2–3 mg/kg body weight/dose daily IV • Children >40 kg body weight, 100 mg/dose daily IV • IV fluconazole • Children, 6–12 mg/kg body weight/dose daily for infants and children of all ages (maximum dose: 600 mg daily).	hours. • Conversion to oral voriconazole should be at 9 mg/kg body weight/dose orally every 12 hours. • Children aged ≥12 years and weighing at least 40 kg can use adult dosing (load 6 mg/ kg body weight/dose every 12 hours IV on day 1, followed by 4 mg/kg body weight/dose every 12 hours IV. Conversion to oral therapy at 200 mg every 12 hours by mouth.) Anidulafungin in Children Aged 2–17 Years • Loading dose of 3 mg/kg body weight/once daily followed by 1.5 mg/kg body weight/once daily (100 mg/day maximum). If a neonate's creatinine level is >1.2 mg/dL for >3 consecutive doses, the dosing interval for **fluconazole** 12 mg/kg body weight may be prolonged to one dose every 48 hours until the serum creatinine level is <1.2 mg/dL *Treatment Duration:* • Patients with esophageal candidiasis should be treated for a minimum of 3 weeks and for at least 2 weeks following resolution of symptoms. • Aged ≥18 years, 400 mg/dose once daily (6 mg/kg body weight once daily). *Treatment Duration:* • Patients with esophageal candidiasis should be treated for a minimum of 3 weeks and for at least 2 weeks following resolution of symptoms.	November 6, 2013

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed

Candidiasis, continued	Invasive Disease:
	Critically Ill Echinocandin Recommended:
	• Anidulafungin
	  • Aged 2–17 years, Load with 3 mg/kg body weight/daily dose and then maintenance at 1.5 mg/kg body weight once daily
	  • Aged ≥18 years, 200 mg loading dose, then 100 mg once daily
	• Caspofungin
	  • Infants aged <3 months, 25 mg/m^2 body surface area/dose once daily IV
	  • Aged 3 months–17 years, 70 mg/m^2 body surface area/day loading dose followed by 50 mg/m^2 once daily (maximum, 70 mg) (note: dosing based on surface area is recommended for children for caspofungin);
	  • Aged ≥18 years, 70-mg loading dose, then 50 mg once daily;
	• Micafungin
	Note: In the United States, optimal dosing for children is not yet established, and there is no pediatric indication yet. Studies indicate linear PK; age and clearance are inversely related—see recommended doses below.
	  • Neonates, up to 10–12 mg/kg bodyweight/dose daily IV may be required to achieve therapeutic concentrations.
	  • Infants <15 kg body weight, 5–7 mg/kg/day
	  • Children ≤40 kg body weight and aged 2–8 years, 3–4 mg/kg body weight/dose daily IV
	  • Children ≤40 kg body weight and aged 9–17 years, 2–3 mg/kg body weight/dose daily
		Invasive Disease:
		• Fluconazole 12 mg/kg body weight IV once daily (maximum 600 mg/day) for minimum 2 weeks after last positive blood culture (if uncomplicated candidemia)
		• Lipid formulations of amphotericin B, 5 mg/kg body weight IV once daily
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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed
Candidiasis, continued	• Children >40 kg body weight, 100 mg/dose daily IV *Not Critically Ill* *Fluconazole Recommended*: • 12 mg/kg body weight/dose daily (max dose: 600 mg) for infants and children of all ages • Avoid fluconazole for *C. krusei* and *C. glabrata*, avoid echinocandin for *C. parapsilosis*. *Treatment Duration*: • Based on presence of deep-tissue foci and clinical response; in patients with candidemia, treat until 2 weeks after last positive blood culture.			November 6, 2013
Coccidioido-mycosis	Severe Illness with Respiratory Compromise due to Diffuse Pulmonary or Disseminated Non-Meningitic Disease: • Amphotericin B deoxycholate 0.5–1.0 mg/kg body weight IV once daily, until clinical improvement. • A lipid amphotericin B preparation can be substituted at a dose of 5 mg/kg body weight IV once daily (dosage of the lipid preparation can be increased to as much as 10 mg/kg body weight IV once daily for life-threatening infection). • After the patient is stabilized, therapy with an azole (fluconazole or itraconazole) can be substituted and continued to complete a 1-year course of antifungal therapy.	Severe Illness with Respiratory Compromise Due to Diffuse Pulmonary or Disseminated Non-Meningitic Disease (If Unable to Use Amphotericin): • Fluconazole 12mg/kg body weight (maximum 800 mg) per dose IV or by mouth once daily • Treatment is continued for total of 1 year, followed by secondary prophylaxis.	Surgical debridement of bone, joint, and/or excision of cavitary lung lesions may be helpful. Itraconazole is the preferred azole for treatment of bone infections. Some experts initiate an azole during amphotericin B therapy; others defer initiation of the azole until after amphotericin B is stopped. For treatment failure, can consider voriconazole, caspofungin, or posaconazole (or combinations). However, experience is limited and definitive pediatric dosages have not been determined. Options should be discussed with an expert in the treatment of coccidioidomycosis. Chronic suppressive therapy (secondary prophylaxis) with fluconazole or itraconazole is routinely recommended following initial induction therapy for disseminated disease and is continued lifelong for meningeal disease. Therapy with amphotericin results In a more rapid clinical response in severe, non-meningeal disease.	November 6, 2013
	Meningeal Infection: • Fluconazole 12 mg/kg body weight (maximum 800 mg) IV or by mouth once daily followed by secondary lifelong prophylaxis.	Meningeal Infection (Unresponsive to Fluconazole): • IV amphotericin B plus intrathecal amphotericin B followed by secondary prophylaxis. **Note:** Expert consultation recommended.		

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed
Coccidioido-mycosis, continued	Mild-to-Moderate Non-Meningeal Infection (e.g., Focal Pneumonia): • Fluconazole 6–12 mg/kg body weight (maximum 400 mg) per dose IV or by mouth once daily.	Mild-to-Moderate Non-Meningeal Infection (e.g., Focal Pneumonia): • Itraconazole 2–5 mg/kg body weight per dose (maximum dose 200 mg) per dose IV or by mouth 3 times daily for 3 days, then 2–5 mg/kg body weight (maximum dose 200 mg) by mouth per dose twice daily thereafter. • Duration of treatment determined by rate of clinical response.		November 6, 2013
Cryptococcosis	CNS Disease *Acute Therapy (Minimum 2-Week Induction Followed by Consolidation Therapy):* • Amphotericin B deoxycholate 1.0 mg/kg body weight (or liposomal amphotericin B 6 mg/kg body weight) IV once daily **PLUS** flucytosine 25 mg/kg body weight per dose by mouth given 4 times daily *Consolidation Therapy (Followed by Secondary Prophylaxis):* • Fluconazole 12 mg/kg body weight on day 1, then 10–12 mg/kg body weight (max 800 mg) once daily IV or by mouth for a minimum of 8 weeks	CNS Disease *Acute Therapy (Minimum 2-Week Induction Followed by Consolidation Therapy)* *If Flucytosine Not Tolerated or Unavailable:* • **A.** Liposomal amphotericin B, 6 mg/kg body weight IV once daily, **or** Amphotericin B Lipid Complex, 5 mg/kg body weight IV once daily, **or** Amphotericin B deoxycholate, 1.0–1.5 mg/kg body weight IV once daily **alone or B. in combination** with high-dose fluconazole (12 mg/kg body weight on day 1 and then 10–12 mg/kg body weight [max 800 mg] IV). **Note:** Data-driven pediatric dosing guidelines are unavailable for fluconazole with use of such combination therapy. *If Amphotericin B-Based Therapy Not Tolerated:* • Fluconazole, 12 mg/kg body weight on day 1 and then 10–12 mg/kg body weight (maximum 800 mg) IV or by mouth once daily **PLUS** flucytosine, 25 mg/kg body weight per dose by mouth given 4 times daily *Consolidation Therapy (followed by secondary prophylaxis):* • Itraconazole 5–10 mg/kg body weight by mouth given once daily, or 2.5–5 mg/kg body weight given twice daily (maximum 200 mg/dose) for a minimum of 8 weeks. A loading dose (2.5–5 mg/kg body weight per dose 3 times daily) is given for the first 3 days (maximum	In patients with meningitis, CSF culture should be negative prior to initiating consolidation therapy. Overall, *in vitro* resistance to antifungal agents used to treat cryptococcosis remains uncommon. Newer azoles (voriconazole, posaconazole, ravuconazole) are all very active *in vitro* against *C. neoformans*, but published clinical experience on their use for cryptococcosis is limited. Liposomal amphotericin and amphotericin B lipid complex are especially useful for children with renal insufficiency or infusion-related toxicity to amphotericin B deoxycholate. Liposomal amphotericin and amphotericin B lipid complex are **significantly more expensive than amphotericin B deoxycholate**. Liquid preparation of itraconazole (if tolerated) is preferable to tablet formulation because of better bioavailability, but it is more expensive. Bioavailability of the solution is better than the capsule, but there were no upfront differences in dosing range based on preparation used. Ultimate dosing adjustments should be guided by itraconazole levels. Serum itraconazole concentrations should be monitored to optimize drug dosing. Amphotericin B may increase toxicity of flucytosine by increasing cellular uptake, or impair its renal	November 6, 2013

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Cryptococcus, continued	Localized Disease, Including Isolated Pulmonary Disease (CNS Not Involved)[b]: • Fluconazole 12 mg/kg body weight on day 1 and then 6–12 mg/kg body weight (maximum 600 mg) IV or by mouth once daily Disseminated Disease (CNS Not Involved) or Severe, Pulmonary Disease[b]: • Amphotericin B 0.7–1.0 mg/ kg body weight, or • Liposomal amphotericin, 3–5 mg/kg body weight, or • Amphotericin B lipid complex 5 mg/kg body weight IV once daily (± flucytosine)	200 mg/ dose; 600 mg/day). See comment on itraconazole under Other Options/Issues. Localized Disease Including Isolated Pulmonary Disease (CNS Not Involved)[b]: • Amphotericin B, 0.7–1.0 mg/kg body weight, or • Amphotericin liposomal 3–5 mg/kg body weight, or • Amphotericin lipid complex, 5 mg/kg body weight IV once daily Disseminated Disease (CNS Not Involved) or Severe, Pulmonary Disease[b]: • Fluconazole, 12 mg/kg body weight on day 1 and then 6–12 mg/kg body weight (maximum 600 mg) IV or by mouth once daily	excretion, or both. Flucytosine dose should be adjusted to keep 2-hour post-dose drug levels at 40–60 µg/mL Oral acetazolamide **should not** be used for reduction of ICP in cryptococcal meningitis. Corticosteroids and mannitol have been shown to be ineffective in managing ICP in adults with cryptococcal meningitis. Secondary prophylaxis is recommended following completion of initial therapy (induction plus consolidation)—drugs and dosing listed above. [b] Duration of therapy for non-CNS disease depends on site and severity of infection and clinical response	November 6, 2013
Cryptosporidiosis	Effective cART: • Immune reconstitution may lead to microbiologic and clinical response	There is no consistently effective therapy for cryptosporidiosis in HIV-infected individuals; optimized cART and a trial of nitazoxanide can be considered. Nitazoxanide (**BI**, HIV-Uninfected; **BII***, HIV-Infected in Combination with Effective cART): • 1–3 years: Nitazoxanide (20 mg/mL oral solution) 100 mg orally twice daily with food • 4–11 years: Nitazoxanide (20 mg/mL oral solution) 200 mg orally twice daily with food • ≥12 years: Nitazoxanide tablet 500 mg orally twice daily with food *Treatment Duration:* • 3–14 days	Supportive Care: • Hydration, correct electrolyte abnormalities, nutritional support Antimotility agents (such as loperamide) should be used with caution in young children.	November 6, 2013

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed
Cytomegalovirus (CMV)	Symptomatic Congenital Infection with Neurologic Involvement: • Ganciclovir 6 mg/kg body weight per dose IV every 12 hours for 6 weeks Disseminated Disease and Retinitis: *Induction Therapy (Followed by Chronic Suppressive Therapy):* • Ganciclovir 5 mg/kg body weight per dose IV every 12 hours for 14–21 days (may be increased to 7.5 mg/kg body weight per dose IV twice daily), then 5 mg/kg body weight once daily for 5–7 days per week for chronic suppression Central Nervous System Disease (Followed by Chronic Suppressive Therapy; See Secondary Prophylaxis): • Ganciclovir 5 mg/kg body weight per dose IV every 12 hours **PLUS** foscarnet 60 mg/kg body weight per dose IV every 8 hours (or 90 mg/kg body weight per dose IV every 12 hours) continued until symptomatic improvement, followed by chronic suppression	Disseminated Disease and Retinitis: *Induction Therapy (Followed by Chronic Suppressive Therapy):* • Foscarnet, 60 mg/kg body weight per dose IV every 8 hours or 90 mg/kg body weight per dose IV every 12 hours x 14 to 21 days, then 90–120 mg/kg body weight IV once daily for chronic suppression Alternatives for Retinitis (Followed by Chronic Suppressive Therapy; See Secondary Prophylaxis): • Valganciclovir tablets 900 mg per dose orally twice daily for 14–21 days, followed by chronic suppressive therapy (see above). **Note:** This is an option in older children who can receive the adult dose (based on their BSA). • IV ganciclovir **plus** IV foscarnet (at above induction doses) may be considered as initial induction therapy in children with sight-threatening disease or for treatment following failure/relapse on monotherapy. • Cidofovir is also used to treat CMV retinitis in adults intolerant to other therapies. Induction dosing in adults is 5 mg/kg body weight IV once weekly for 2 weeks, followed by chronic suppressive therapy (see secondary prophylaxis); however, data on dosing in children are unavailable. Must be given with probenecid and IV hydration	• Data on valganciclovir dosing in young children for treatment of retinitis are unavailable, but consideration can be given to transitioning from IV ganciclovir to oral valganciclovir after improvement of retinitis is noted. • Intravitreal injections of ganciclovir, foscarnet, or cidofovir are used in adults for retinitis but are not practical for most children. • Combination ganciclovir and foscarnet is associated with substantial rates of adverse effects, and optimal treatment for neurologic disease in children is unknown, particularly if receiving optimized cART. • Chronic suppressive therapy (secondary prophylaxis) is recommended in adults and children following initial therapy of disseminated disease, retinitis, neurologic disease, or GI disease with relapse.	November 6, 2013

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed

Giardiasis	• Tinidazole, 50 mg/kg by mouth, administered as 1 dose given with food (maximum 2 g). **Note:** Based on data from HIV-uninfected children
	• Nitazoxanide. **Note:** Based on data from HIV-uninfected children
	  • 1–3 years: 100 mg by mouth every 12 hours with food for 3 days
	  • 4–11 years: 200 mg by mouth every 12 hours with food for 3 days
	  • ≥12 years: 500 mg by mouth every 12 hours with food for 3 days
		Metronidazole 5 mg/kg by mouth every 8 hours for 5-7 days.
		Note: Based on data from HIV-uninfected children
			Tinidazole is approved in the United States for children aged ≥3 years. It is available in tablets that can be crushed.
			Metronidazole has high frequency of gastrointestinal side effects. A pediatric suspension of metronidazole is not commercially available but can be compounded from tablets. It is not FDA-approved for the treatment of giardiasis.
			Supportive Care:
			• Hydration
			• Correction of electrolyte abnormalities
			• Nutritional support
			Antimotility agents (e.g., loperamide) should be used with caution in young children.
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Hepatitis B Virus (HBV)	Treatment of Only HBV Required (Child Does Not Require cART): • IFN-α 3 million units/m^2 body surface area SQ 3 times a week for 1 week, followed by dose escalation to 6 million units/m^2 body surface area (max 10 million units/dose), to complete a 24-week course, or • For children aged ≥12 years, adefovir 10 mg by mouth once daily for a minimum of 12 months (uncertain if risk of HIV resistance) Treatment of Both HIV And HBV Required (Child Not Already Receiving 3TC or FTC) • 3TC 4 mg/kg body weight (maximum 150 mg) per dose by mouth twice daily as part of a fully suppressive cART regimen • For children aged ≥2 years, include tenofovir as part of cART regimen with 3TC or FTC. For children aged ≥12, tenofovir dose is 300 mg once daily. For children aged <12 year, and 8 mg/kg body weight per dose once daily (maximum dose 300 mg)	• IFN-α 10 million units/m^2 body surface area SQ 3 times a week for 6 months (sometimes used for retreatment of failed lower-dose interferon therapy) • Alternative for 3TC: FTC 6 mg/kg body weight (maximum 200 mg) once daily	Indications for Treatment Include: • Detectable serum HBV DNA, irrespective of HBeAg status, for >6 months; and • Persistent (>6 months) elevation of serum transaminases (≥ twice the upper limit of normal); or • Evidence of chronic hepatitis on liver biopsy IFN-α is contraindicated in children with decompensated liver disease; significant cytopenias, severe renal, neuropsychiatric, or cardiac disorders; and autoimmune disease. Choice of HBV treatment options for HIV/HBV-co-infected children depends upon whether concurrent HIV treatment is warranted. 3TC and FTC have similar activity (and have cross-resistance) and should not be given together. FTC is not FDA-approved for treatment of HBV. Tenofovir is approved for use in treatment of HIV infection in children aged ≥2 years but it is not approved for treatment of HBV infection in children aged <18 years. It should only be used for HBV in HIV/HBV-infected children as part of a cART regimen.	November 6, 2013

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed
Hepatitis B Virus (HBV), continued	Treatment of Both HIV and HBV Required (Child Already Receiving cART Containing 3TC or FTC, Suggesting 3TC/FTC Resistance): • For children aged ≥2 years, include tenofovir as part of cART regimen with 3TC or FTC. For children aged ≥12 years, tenofovir dose is 300 mg once daily. For children aged <12 years, 8 mg/kg body weight per dose once daily (maximum dose 300 mg) • For children aged ≥12 years, add adefovir 10 mg by mouth once daily or entecavir 0.5 mg by mouth once daily in addition to cART regimen. • For children aged <12 years, give 6-month course of IFN-α as above in addition to cART regimen.		Adefovir is approved for use in children aged ≥12 years. ETV is not approved for use in children younger than age 16 years, but is under study in HIV-uninfected children for treatment of chronic hepatitis B. Can be considered for older HIV-infected children who can receive adult dosage. It should only be used for HBV in HIV/HBV-infected children who also receive an HIV-suppressive cART regimen. IRIS may be manifested by dramatic increase in transaminases as CD4 cell counts rise within the first 6 to 12 weeks of cART. It may be difficult to distinguish between drug-induced hepatotoxicity and other causes of hepatitis and IRIS. In children receiving tenofovir and 3TC or FTC, clinical and laboratory exacerbations of hepatitis (flare) may occur if the drug is discontinued; thus, once anti-HIV/HBV therapy has begun, it should be continued unless contraindicated or until the child has been treated for >6 months after HBeAg seroconversion and can be closely monitored on discontinuation. If anti-HBV therapy is discontinued and a flare occurs, reinstitution of therapy is recommended because a flare can be life threatening. Telbivudine has been approved for use in people aged ≥16 years with HBV; there are no data on safety or efficacy in children aged <16 years; a pharmacokinetic study is under way in HIV-uninfected children.	November 6, 2013

Hepatitis C Virus (HCV)	IFN-α Plus Ribavirin Combination Therapy:
	• Pegylated IFN-α: Peg-IFN 2a 180 µg/1.73 m^2 body surface area subcutaneously once per week (maximum dose 180 µg) OR Peg-IFN 2b 60 µg/m^2 body surface area once per week
	PLUS
	• Ribavirin (oral) 7.5 mg/kg body weight twice daily (fixed dose by weight recommended):
	  • 25–36 kg: 200 mg a.m. and p.m.
	  • >36 to 49 kg: 200 mg a.m.
		None	Optimal duration of treatment for HIV/HCV-coinfected children is unknown and based on recommendations for HIV/HCV-coinfected adults
			Treatment of HCV in children <3 years generally is not recommended.
			Indications for treatment are based on recommendations in HIV/HCV-coinfected adults; because HCV therapy is more likely to be effective in younger patients and in those without advanced disease or immunodeficiency, treatment should be considered for all HIV/HCV-coinfected children aged >3 years in whom there are no contraindications to treatment
			For recommendations related to use of telaprevir or boceprevir in adults, including
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Hepatitis C Virus (HCV), continued	and 400 mg p.m. • >49 to 61 kg: 400 mg a.m. and p.m. • >61 to 75 kg: 400 mg a.m. and 600 mg p.m. • >75 kg: 600 mg a.m. and p.m. <u>Treatment Duration</u>: • 48 weeks, regardless of HCV genotype		warnings about drug interactions between HCV protease inhibitors and HIV protease inhibitors and other antiretroviral drugs, see *Adult OI guidelines*. IRIS may be manifested by dramatic increase in transaminases as CD4 cell counts rise within the first 6–12 weeks of cART. It may be difficult to distinguish between IRIS and drug-induced hepatotoxicity or other causes of hepatitis. IFN-α is contraindicated in children with decompensated liver disease, significant cytopenias, renal failure, severe cardiac disorders and non-HCV-related autoimmune disease. Ribavirin is contraindicated in children with unstable cardiopulmonary disease, severe pre-existing anemia or hemoglobinopathy. Didanosine combined with ribavirin may lead to increased mitochondrial toxicities; concomitant use is contraindicated. Ribavirin and zidovudine both are associated with anemia, and when possible, should not be administered together	November 6, 2013
Herpes Simplex Virus Infections (HSV)	<u>Neonatal CNS or Disseminated Disease</u>: • Acyclovir 20 mg/kg body weight IV/dose TID for ≥21 days <u>Neonatal Skin, Eye, or Mouth Disease</u>: • Acyclovir 20 mg/kg body weight IV/dose TID for 14 days <u>CNS or Disseminated Disease in Children Outside the Neonatal Period</u>: • Acyclovir 10 mg/kg body weight (up to 20 mg/kg body weight/dose in children <12 years) IV TID for 21 days <u>Moderate to Severe Symptomatic Gingivostomatitis</u>: • Acyclovir 5–10 mg/kg body weight/dose IV TID. Patients can be switched to oral therapy after lesions have begun to regress and therapy continued until lesions have completely healed.	• Valacyclovir is approved for immuno-competent adults and adolescents with first-episode mucocutaneous HSV at a dose of 1 g/dose by mouth BID for 7–10 days; also approved for recurrent herpes labialis in children ≥12	<u>For Neonatal CNS Disease</u>: • Repeat CSF HSV DNA PCR should be performed on days 19 to 21 of therapy; do not stop acyclovir until repeat CSF HSV DNA PCR is negative.	November 6, 2013

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed
Herpes Simplex Virus Infections (HSV), continued	Mild Symptomatic Gingivostomatitis: • Acyclovir 20 mg/kg body weight (maximum 400 mg/dose) dose by mouth QID for 7–10 days Recurrent Herpes Labialis: • Acyclovir 20 mg/kg body weight (maximum 400 mg/dose) dose by mouth QID for 5 days For First-Episode Genital Herpes (Adults and Adolescents): • Acyclovir 20 mg/kg body weight (maximim 400 mg/dose) dose by mouth TID for 7–10 days Recurrent Genital Herpes (Adults and Adolescents): • Acyclovir 20 mg/kg body weight (maximum 400 mg/dose) dose by mouth TID for 5 days Children with HSV Keratoconjunctivitis: • Often treated with topical trifluridine (1%) or acyclovir (3%) applied as 1–2 drops 5 times daily. Many experts add oral acyclovir to the topical therapy. Children with ARN: • For children old enough to receive adult dose, acyclovir 10–15 mg/kg body weight/dose IV every 8 hours for 10–14 days, followed by oral valacyclovir 1 g/dose TID for 4–6 weeks • As an alternative, oral acyclovir 20 mg/kg body weight/dose QID for 4–6 weeks after IV acyclovir for 10–14 days	years using two, 2 g doses by mouth separated by 12 hours as single-day therapy. • Recurrent genital HSV can be treated with valacyclovir 500 mg BID for 3 days or 1 g by mouth daily for 5 days. • Immunocompetent adults with recurrent herpes labialis can be treated with famciclovir, 1 g/dose by mouth BID for 1 day. • Famciclovir is approved to treat primary genital HSV in immunocompetent adults at a dose of 250 mg/dose by mouth TID for 7–10 days. • Recurrent genital HSV is treated with famciclovir 1 g/dose by mouth BID at a 12-hour interval for 2 doses • Famciclovir is approved for use in HIV-infected adults and adolescents with recurrent mucocutaneous HSV infection at a dose of 500 mg/dose by mouth BID for 7 days. Acyclovir-Resistant HSV Infection: • Foscarnet 40 mg/kg body weight/dose given IV TID (or 60 mg/kg body weight/dose BID) should be administered slowly over the course of 2 hours (i.e., no faster than 1 mg/kg/minute).	• There is no pediatric preparation of valacyclovir (although crushed capsules can be used to make a suspension) and data on dosing in children are limited; can be used by adolescents able to receive adult dosing. • There is no pediatric preparation of famciclovir and data on dosing in children are unavailable; can be used by adolescents able to receive adult dosing. Alternative and Short-Course Therapy in Immunocompromised Adults with Recurrent Genital Herpes: • Acyclovir 800 mg per dose by mouth BID for 5 days • Acyclovir 800 mg per dose by mouth TID for 2 days **Note:** Consultation with an ophthalmologist experienced in managing herpes simplex infection involving the eye and its complications in children is strongly recommended when ocular disease is present.	November 6, 2013

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed
Histoplasmosis	Acute Primary Pulmonary Histoplasmosis: • Itraconazole oral solution loading dose of 2–5 mg/kg body weight (maximum 200 mg) per dose by mouth 3 times daily for first 3 days of therapy, followed by 2–5 mg/kg body weight (max 200 mg) per dose by mouth twice daily for 12 months. Duration of 12 weeks is sufficient for HIV-infected children, with functional cellular immunity (CD4 percentage >20% or if aged ≥6, CD4 cell count >300 cells/mm^3), provided monitoring confirms clinical improvement and decreased urine antigen concentrations. Mild Disseminated Disease: • Itraconazole oral solution loading dose of 2–5 mg/kg body weight (maximum 200 mg) per dose by mouth 3 times daily for first 3 days of therapy, followed by 2–5 mg/kg body weight (maximum 200 mg) per dose by mouth twice daily for 12 months Moderately Severe to Severe Disseminated Disease: *Acute Therapy (Minimum 2-Week Induction, Longer if Clinical Improvement is Delayed, Followed by Consolidation Therapy):* • Liposomal amphotericin B 3–5 mg/kg body weight, IV once daily (preferred) • Amphotericin B deoxycholate 0.7–1 mg/kg body weight IV once daily (alternative) *Consolidation Therapy (Followed by Chronic Suppressive Therapy):* • Itraconazole oral solution initial loading dose of 2–5 mg/kg body weight (maximum 200 mg) per dose by mouth 3 times daily for first 3 days of therapy, followed by 2–5 mg/kg body weight (max 200 mg) per dose by mouth given twice daily for 12 months Central Nervous System Infection *Acute Therapy (4–6 Weeks, Followed by Consolidation Therapy):* • Liposomal amphotericin B, 5 mg/kg body weight IV once daily	Acute Primary Pulmonary Histoplasmosis: • Fluconazole 3–6 mg/kg body weight (maximum 200 mg) by mouth once daily Mild Disseminated Disease: • Fluconazole 5–6 mg/kg body weight IV or by mouth (maximum 300 mg) per dose, twice daily (maximum 600 mg/day) for 12 months Moderately Severe to Severe Disseminated Disease: • If itraconazole not tolerated, amphotericin alone for 4–6 weeks can be used with monitoring that confirms decline in histoplasma urine and serum antigen levels. • Liposomal amphotericin B 3–5 mg/kg body weight IV once daily (preferred) for 4–6 weeks • Amphotericin B deoxycholate 0.7–1 mg/kg body weight IV once daily (alternative) for 4–6 weeks	Use same initial itraconazole dosing for capsules as for solution. Itraconazole solution is preferred to the capsule formulation because it is better absorbed; solution can achieve serum concentrations 30% higher than those achieved with the capsules. Urine antigen concentration should be assessed at diagnosis. If >39 ng/mL, serum concentrations should be followed. When serum levels become undetectable, urine concentrations should be monitored monthly during treatment and followed thereafter to identify relapse. Serum concentrations of itraconazole should be monitored and achieve a level of 1 µg/mL at steady-state. Levels exceeding 10 µg/mL should be followed by dose reduction. High relapse rate with CNS infection occurs in adults and longer therapy may be required; treatment in children is anecdotal and expert consultation should be considered. Chronic suppressive therapy (secondary prophylaxis) with itraconazole is recommended in adults and children following initial therapy. Amphotericin B deoxycholate is better tolerated in children than in adults. Liposomal amphotericin B is preferred for treatment of parenchymal cerebral lesions.	November 6, 2013

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed
Histoplasmosis, continued	**(AII)** *Consolidation Therapy (Followed by Chronic Suppressive Therapy):* • Itraconazole oral solution initial loading dose of 2–5 mg/kg body weight (maximum 200 mg) per dose by mouth 3 times daily for first 3 days of therapy, followed by 2–5 mg/kg body weight (max 200 mg) per dose by mouth given twice daily for ≥12 months and until histoplasma antigen is no longer detected in cerebrospinal fluid			November 6, 2013
Human Papillomavirus (HPV)	• Podofilox solution/gel (0.5%) applied topically BID for 3 consecutive days a week up to 4 weeks (patient applied). Withhold treatment for 4 days and repeat the cycle weekly up to 4 times **(BIII)** • Imiquimod cream (5%) applied topically at night and washed off in the morning for 3 non-consecutive nights a week for up to 16 weeks (patient applied) **(BII)** • TCA or BCA (80%–90%) applied topically weekly for up to 3 to 6 weeks (provider applied) **(BIII)** • Podophyllin resin (10%–25% suspension in tincture of benzoin) applied topically and washed off several hours later, repeated weekly for 3 to 6 weeks (provider applied) **(CIII)** • Cryotherapy with liquid nitrogen or cryoprobe applied every 1–2 weeks **(BIII)** • Surgical removal either by tangential excision, tangential shave excision, curettage, or electrosurgery	• Intralesional IFN-α is generally not recommended because of high cost, difficult administration, and potential for systemic side effects **(CIII)** • Cidofovir topical gel (1%) is an experimental therapy studied in HIV-infected adults that is commercially available through compounding pharmacies and has very limited use in children; systemic absorption can occur **(CIII)**. • 5-FU/epinephrine gel implant should be offered in only severe recalcitrant cases because of inconvenient routes of administration, frequent office visits, and a high frequency of systemic adverse effects.	Adequate topical anesthetics to the genital area should be given before caustic modalities are applied. Sexual contact should be limited while solutions or creams are on the skin. Although sinecatechins (15% ointment) applied TID up to 16 weeks is recommended in immunocompetent individuals, data are insufficient on safety and efficacy in HIV-infected individuals. cART has not been consistently associated with reduced risk of HPV-related cervical abnormalities in HIV-infected women. Laryngeal papillomatosis generally requires referral to a pediatric otolaryngologist. Treatment is directed at maintaining the airway, rather than removing all disease. For women who have exophytic cervical warts, a biopsy to exclude HSIL must be performed before treatment. Liquid nitrogen or TCA/BCA is recommended for vaginal warts. Use of a cryoprobe in the vagina is not recommended. Cryotherapy with liquid nitrogen or podophyllin resin (10%–25%) is recommended for urethral meatal warts. Cryotherapy with liquid nitrogen or TCA/BCA or surgical removal is recommended for anal warts. Abnormal Pap smear cytology should be referred to colposcopy for diagnosis and management.	November 6, 2013

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed

Influenza A and B	Oseltamivir for 5 days[e]:
	• Aged <3 months; 3 mg/kg/dose twice daily
	• Aged 3 months to <1 year; 3 mg/kg/dose twice daily
	• Aged ≥1 to 12 years; weight-band dosing
	  • ≤15 kg: 30 mg twice-daily
	  • >15 kg to 23 kg: 45 mg twice daily
	  • >23 kg to 40 kg: 60 mg twice daily
	  • >40 kg: 75 mg twice daily
	• Aged ≥13 years; 75 mg twice daily
	Zanamivir (aged ≥7 years) for 5 days:
	• 10 mg (2 inhalations) twice daily[f]
		None	[e]Oseltamivir is FDA-approved for treatment of influenza in children aged ≥2 weeks. The CDC recommends that clinicians who treat children ages ≥3 months to <1 year administer a dose of 3 mg/kg twice daily. A dose of 3 mg/kg/dose twice daily also is recommended for infants aged <3 months.
			Premature Infants: Current weight-based dosing recommendations for oseltamivir are not appropriate for premature infants: gestational age at delivery <38 weeks. See *J Infect Dis* 202 [4]:563-566, 2010 for dosing recommendations in premature infants.
			Oseltamivir treatment duration: Recommended duration for antiviral treatment is 5 days; longer treatment courses can be considered for patients who remain severely ill after 5 days of treatment.
			Renal insufficiency: A reduction in dose of oseltamivir is recommended for patients with creatinine clearance <30 mL/min.
			[f]**Zanamivir:** Zanamivir is not recommended for treatment in children aged <7 years.
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Influenza A (ONLY) *Oseltamivir-resistant, adamantane-sensitive strains*
(Based on CDC influenza surveillance www.cdc.gov/flu/weekly/fluactivitysurv.htm)
	Amantadine for 5 days[d]:
	• Aged 1–9 years; 2.5 mg/kg body weight/dose twice daily (maximum dose of 150 mg/day)
	• Aged ≥10 years
	  • <40 kg: 2.5 mg/kg body weight/dose twice daily
	  • ≥40 kg: 100 mg per dose twice daily (maximum dose, 200 mg/day)
	Rimantadine for 5 days[d]:
	• Aged ≥13 years; 100 mg per dose twice daily (maximum dose of 200 mg/day)
			[d]**Adamantanes:** Because of resistance in currently circulating influenza A virus strains, amantadine and rimantadine are not currently recommended for chemoprophylaxis or treatment (adamantanes are not active against influenza B virus). However, potential exists for emergence of oseltamivir-resistant, adamantane-sensitive circulating influenza A strains. Therefore, verification of antiviral sensitivity of circulating influenza A strains should be done using the CDC influenza surveillance website: http://www.cdc.gov/flu/weekly/fluactivitysurv.htm
			If administered based on CDC antiviral sensitivity surveillance data, both amantadine and rimantadine are recommended for chemoprophylaxis of influenza A in children aged ≥1 yr. For treatment, rimantadine is only approved for use in adolescents aged ≥13 years. Rimantadine is preferred over amantadine because of less frequent adverse events. Some pediatric influenza specialists may consider it appropriate for treatment of children aged >1 year.
			Renal insufficiency: A reduction in dose of amantadine is recommended for patients with creatinine clearance <30 mL/min.	

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed

Isosporiasis (Cystoisosporiasis)	TMP-SMX 5 mg/kg body weight of TMP component given twice daily by mouth for 10 days	Pyrimethamine 1 mg/kg body weight plus folinic acid 10-25 mg by mouth once daily for 14 days
		
		Second-Line Alternatives:
		• Ciprofloxacin 10–20 mg/kg body weight/day twice daily by mouth for 7 days
		• Nitazoxanide (see doses below) for 3 consecutive days
		  • Children 1–3 years: 100 mg by mouth every 12 hours
		  • Children 4–11 years: 200 mg by mouth every 12 hours
		  • Adolescents ≥12 years and adults: 500 mg by mouth every 12 hours
			If symptoms worsen or persist, the TMP-SMX dose may be increased to 5 mg/kg/day given 3–4 times daily by mouth for 10 days or the duration of treatment may be lengthened. Duration of treatment with pyrimethamine has not been well established.
			
			Ciprofloxacin is generally not a drug of first choice in children due to increased incidence of adverse events, including events related to joints and/or surrounding tissues.
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Malaria	Uncomplicated *P. Falciparum* or Unknown Malaria Species, from Chloroquine-Resistant Areas (All Malaria Areas Except Those Listed as Chloroquine Sensitive) or Unknown Region:
	• Atovaquone-proguanil (pediatric tablets 62.5 mg/25 mg; adult tablets 250 mg/100 mg), dosed once daily:
	  • 5–8 kg; 2 pediatric tablets for 3 days;
	  • 9–10 kg; 3 pediatric tablets for 3 days;
	  • 11–20 kg; 4 pediatric tablets or 1 adult tablet for 3 days;
	  • 21–30 kg; 2 adult tablets for 3 days;
	  • 31–40 kg; 3 adult tablets for 3 days;
	  • >40 kg; 4 adult tablets for 3 days
	
	Uncomplicated *P. Falciparum* OR Unknown Malaria Species From Chloroquine-Sensitive Region (See Comments for Link to Resistance Map):
	• Chloroquine phosphate: 16.6 mg/kg body weight (10 mg/kg body weight chloroquine base) (maximum 1000 mg) by mouth once, then 8.3 mg/kg body weight (maximum 500 mg) by mouth at 6, 24, and 48 hours (total dose = 41.6 mg/kg body weight
		N/A	For quinine-based regimens, doxycycline or tetracycline should be used only in children aged ≥8 years. An alternative for children aged ≥8 years is clindamycin 7 mg/kg body weight per dose by mouth given every 8 hours. Clindamycin should be used for children aged <8 years.
			
			Before primaquine is given, G6PD status **must** be verified. Primaquine may be given in combination with chloroquine if the G6PD status is known and negative, otherwise give after chloroquine (when G6PD status is available)
			
			For most updated prevention and treatment recommendations for specific region, refer to updated CDC treatment table available at http://www.cdc.gov/malaria/resources/ pdf/treatmenttable.pdf
			
			For sensitive and resistant malaria map: http://cdc-malaria.ncsa.uiuc.edu/
			
			High treatment failure rates due to chloroquine-resistant *P. vivax* have been documented in Papua New Guinea and Indonesia.	

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed
Malaria, continued	chloroquine phosphate [maximum 2500 mg] = 25 mg/kg body weight chloroquine base) *P. vivax, P. ovale, P. malariae, P. knowlesi* (All Areas Except Papua New Guinea, Indonesia; See Comments) *Initial Therapy (Followed by Anti-Relapse Therapy for P. Ovale and P. Vivax):* • Chloroquine phosphate 16.6 mg/kg body weight (10 mg/kg body weight chloroquine base) (maximum 1000 mg) by mouth once, then 8.3 mg/kg body weight (maximum 500 mg) by mouth at 6, 24, and 48 hours (total dose = 41.6 mg/kg body weight chloroquine phosphate [maximum 2500 mg] = 25 mg/kg body weight chloroquine base) *Anti-Relapse Therapy for P. ovale, P. vivax:* • Primaquine 0.5 mg base/kg body weight (max 30 mg base) by mouth once daily for 14 days Uncomplicated *P. falciparum* or Unknown Malaria Species from Chloroquine-Resistant Areas (All Malaria Areas Except Those Listed as Chloroquine Sensitive) or Unknown Region: • Mefloquine (250-mg tablets only): 15 mg/kg body weight (maximum 750 mg) by mouth once, then 10 mg/kg body weight (maximum 500 mg) by mouth given 12 hours later • Quinine sulfate 10 mg/kg body weight (maximum 650 mg) per dose by mouth every 8 hours for 3 to 7 days, **plus** Clindamycin 7 mg/kg body weight per dose by mouth every 8 hours for 7 days, **or** doxycycline: 2.2 mg/kg body weight per dose (maximum 100 mg) given by mouth every 12 hours, **or** tetracycline 6–12.5 mg/kg body weight per dose by mouth given every 6 hours (maximum dose: 500 mg per dose given 4 times daily) for 7 days. • Artemether-lumefantrine: 1 tablet = 20 mg Artemether and 120 mg lumefantrine, a 3-day treatment schedule for a total of 6 doses. The		Treatment should be selected from one of the three following options: • Atovaquone-proguanil plus primaquine phosphate • Quinine sulfate plus **EITHER** doxycycline **OR** tetracycline **PLUS** primaquine phosphate. This regimen cannot be used in children aged <8 years. • Mefloquine plus primaquine phosphate	November 6, 2013

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed
Malaria, continued	second dose follows the initial dose 8 hours later, then 1 dose twice daily for the next 2 days. • 5 to <15 kg; 1 tablet per dose • 15 to <25 kg; 2 tablets per dose • 25 to <35 kg; 3 tablets per dose • >35 kg; 4 tablets per dose			
Severe Malaria	• Quinidine gluconate 10 mg/kg body weight IV loading dose over 1–2 hours, then 0.02 mg/kg body weight/minute infusion for ≥24 hours (Treatment duration: 7 days in Southeast Asia, Oceania, otherwise 3 days) PLUS One of the Following: • Doxycycline 100 mg per dose by mouth every 12 hours for 7 days; for children <45 kg, use 2.2 mg/kg body weight per dose OR • Clindamycin 7 mg/kg body weight per dose by mouth given every 8 hours for 7 days. OR • Tetracycline 6–12.5 mg/kg body weight per dose every 6 hours (maximum dose 500 mg per dose given 4 times daily) for 7 days • Artesunate 2.4 mg/kg body weight IV bolus at 0, 12, 24, and 48 hours PLUS One of the Following: • Doxycycline (treatment dosing as above), or Atovaquone-proguanil (treatment dosing as above), or • Mefloquine 15 mg/kg body weight (maximum 750 mg) by mouth once, then 10 mg/kg body weight (maximum 500 mg) by mouth once given 12 hours later, or • Clindamycin (dosing as above)	N/A	Quinidine gluconate is a class 1a anti-arrhythmic agent not typically stocked in pediatric hospitals. When regional supplies are unavailable, the CDC Malaria hotline may be of assistance (see below). **Do not** give quinidine gluconate as an IV bolus. Quinidine gluconate IV should be administered in a monitored setting. Cardiac monitoring required. Adverse events including severe hypoglycemia, prolongation of the QT interval, ventricular arrhythmia, and hypotension can result from the use of this drug at treatment doses. IND: IV artesunate is available from CDC. Contact the CDC Malaria Hotline at (770) 488-7788 from 8 a.m.–4:30 p.m. EST or (770) 488-7100 after hours, weekends, and holidays. Artesunate followed by one of the following: Atovaquone-proguanil (Malarone™), clindamycin, mefloquine, or (for children aged >8 years) doxycycline. Quinidine gluconate: 10 mg = 6.25 mg quinidine base. Doxycycline (or tetracycline) should be used in children aged ≥8 years. For patients unable to take oral medication, may give IV. For children <45 kg, give 2.2 mg/kg IV every 12 hours and then switch to oral doxycycline. For children >45 kg, use the same dosing as per adults. For IV use, avoid rapid administration. For patients unable to take oral clindamycin, give 10 mg base/kg loading dose IV, followed by 5 mg base/kg IV every 8 hours. Switch to oral clindamycin (oral dose as above) as soon as a patient can take oral medication. For IV use, avoid rapid administration. Drug Interactions: • Avoid co-administration of quinidine with ritonavir • Use quinidine with caution with other protease inhibitors.	November 6, 2013

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed
Microsporidiosis	Effective ART Therapy: • Immune reconstitution may lead to microbiologic and clinical response For Disseminated (Not Ocular) and Intestinal Infection Attributed to Microsporidia Other Than *E. bieneusi* or *V. corneae*: • Albendazole 7.5 mg/kg body weight (maximum 400 mg/dose) by mouth twice daily (in addition to ART) *Treatment Duration:* • Continue until sustained immune reconstitution (longer than 6 months at CDC immunologic category 1 or 2) after initiation of ART and resolution of signs and symptoms For *E. bieneusi* or *V. corneae* infections: • Fumagillin (where available) adult dose 20 mg by mouth 3 times daily, *or* • TNP-470 (a synthetic analogue of fumagillin; where available) recommended for treatment of infections due to *E. bieneusi* in HIV-infected adults (in addition to ART) For Ocular Infection: • Topical fumagillin bicyclohexylammonium (Fumidil B) 3 mg/mL in saline (fumagillin 70 µg/mL) eye drops: 2 drops every 2 hours for 4 days, then 2 drops QID (investigational use only in United States) **plus**, for microsporidial infection other than *E. bieneusi* and *V. corneae*, albendazole 7.5 mg/kg body weight (maximum 400 mg/dose) by mouth twice daily for management of systemic infection (in addition to ART) *Treatment Duration:* • Continue until sustained immune reconstitution (longer than 6 months at CDC immunologic category 1 or 2) after initiation of ART and resolution of signs and symptoms.	N/A	• Supportive care: (e.g., hydration, correction of electrolyte abnormalities, nutritional support) • Fumagillin for systemic use is unavailable in the United States and data on dosing in children are unavailable. Consultation with an expert is recommended.	December 15, 2016

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed
***Mycobacterium avium* Complex (MAC)**	Initial Treatment (≥2 Drugs): • Clarithromycin 7.5–15 mg/kg body weight (maximum 500 mg/ dose) orally twice daily **plus** ethambutol 15–25 mg/kg body weight (maximum 2.5 g/day) orally once daily followed by chronic suppressive therapy For Severe Disease, Add: • Rifabutin 10–20 mg/kg body weight (maximum 300 mg/day) orally once daily	If Intolerant to Clarithromycin: • Azithromycin 10–12 mg/ kg body weight (maximum 500 mg/day) orally once daily If Rifabutin Cannot Be Administered and a Third Drug is Needed in Addition to a Macrolide and Ethambutol, or if a Fourth Drug is Needed in Addition to Rifabutin for Patients with More Severe Symptoms or Disseminated Disease: • Ciprofloxacin 10–15 mg/ kg orally twice daily (maximum 1.5 g/day), or • Levofloxacin 500 mg daily once daily, or • Amikacin 15–30 mg/kg body weight IV in 1 or 2 divided doses (maximum 1.5 g/day)	Combination therapy with a minimum of 2 drugs is recommended for at least 12 months. Clofazimine is associated with increased mortality in HIV-infected adults and should not be used. Children receiving ethambutol who are old enough to undergo routine eye testing should have monthly monitoring of visual acuity and color discrimination. Fluoroquinolones (e.g., ciprofloxacin and levofloxacin) are not labeled for use in children aged <18 years because of concerns regarding potential effects on cartilage; use in younger individuals requires an assessment of potential risks and benefits Chronic suppressive therapy (secondary prophylaxis) is recommended in children and adults following initial therapy.	November 6, 2013
Mycobacterium Tuberculosis	Intrathoracic Disease *Drug-Susceptible TB* *Intensive Phase (2 Months):* • Isoniazid, 10–15 mg/kg body weight (maximum 300 mg/day) by mouth once daily, **plus** • Rifampin 10–20 mg/kg body weight (maximum 600 mg/day) by mouth once daily, **plus** • Pyrazinamide 30–40 mg/kg body weight (maximum 2 g/day) by mouth once daily, **plus** • Ethambutol 15–25 mg/kg body weight (maximum 2.5 g/day) by mouth once daily *Continuation Phase (7 Months):* • Isoniazid 10–15 mg/kg body weight (maximum 300 mg/day) by mouth once daily, **plus** • Rifampin 10–20 mg/kg body weight (maximum 600 mg/day) by mouth once daily Extrathoracic Disease: **Note:** Depends on disease entity • Lymph node TB—treat as minimal intrathoracic disease	Alternative for Rifampin: • Rifabutin 10–20 mg/kg body weight (maximum 300 mg/day) by mouth once daily (same dose if 3 times a week) • Discuss with an expert. Alternative Continuation Phase *If Good Adherence and Treatment Response:* • Isoniazid 20–30 mg/kg body weight (maximum 900 mg/day) by mouth, plus • Rifampin 10–20 mg/kg body weight (maximum 600 mg/day) three times a week. • In children with minimal disease with fully drug-susceptible TB in the absence of significant immune compromise, a 3-drug intensive phase regimen (excluding ethambutol) and a continuation phase of 4 months can be considered (total duration of therapy of 6 months).	Only DOT. If cART-naive, start TB therapy immediately and initiate cART within 2–8 weeks. Already on cART; review to minimize potential toxicities and drug-drug interactions; start TB treatment immediately. Potential drug toxicity and interactions should be reviewed at every visit. Adjunctive Treatment: • Co-trimoxazole prophylaxis • Pyridoxine 1–2 mg/kg/ body weight/day (maximum 25–50 mg/day) with isoniazid or cycloserine/terizidone or, if malnourished; pyridoxine supplementation is recommended for exclusively breastfed infants and for children and adolescents on meat- and milk-deficient diets; children with nutritional deficiencies, including all symptomatic HIV-infected children; and pregnant adolescents and women. • Corticosteroids (2 mg/kg body weight per day of prednisone	November 6, 2013

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed
Mycobacterium Tuberculosis	• Bone or joint disease–consider extending continuation phase to 10 months (for total duration of therapy of 12 months). TB Meningitis: • As alternative to ethambutol or streptomycin, 20–40 mg/kg body weight (maximum 1 g/day) IM once daily—during intensive phase, consider ethionamide, 15–20 mg/kg body weight by mouth (maximum 1 g/day), initially divided into 2 doses until well tolerated) • Consider extending continuation phase to 10 months (for total duration of therapy of 12 months). • Discuss with an expert. *Drug-Resistant TB* *MDR-TB:* • Therapy should be based on resistance pattern of child (or of source case where child's isolate is not available); consult an expert. Treatment Duration: • 18–24 months after non-bacteriological diagnosis or after culture conversion; ≥12 months if minimal disease • Discuss with an expert.		[maximum, 60 mg/day] or its equivalent for 4–6 weeks followed by tapering) with CNS disease or pericardial effusion; may be considered with pleural effusions, severe airway compression, or severe IRIS. Second-Line Drug Doses: • Amikacin 15–30 mg/kg body weight (maximum 1 g/day) IM or IV once daily • Kanamycin 15–30 mg/kg body weight (maximum 1 g/day) IM or IV once daily • Capreomycin 15–30 mg/kg body weight (maximum 1 g/day) IM once daily • Ofloxacin 15–20 mg/kg body weight (maximum 800 mg/day), or levofloxacin 7.5–10 mg/kg body weight (maximum 750 mg/day) by mouth once daily. Because some fluoroquinolones are approved by the FDA for use only in people aged 18 years and older, their use in younger patients necessitates careful assessment of the potential risks and benefits. • Cycloserine/Terizidone 10–20 mg/kg body weight (maximum 1 g/day) by mouth once daily • Ethionamide/prothionamide, 15–20 mg/kg body weight (maximum 1 g/day) by mouth in 2–3 divided doses • Para-aminosalicylic acid 200–300 mg/kg body weight by mouth divided into 3–4 doses per day (maximum 10 g/day). • Thiacetazone can cause severe reactions in HIV-infected children including rash and aplastic anemia, and should not be used.	November 6, 2013

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed
***Pneumocystis* Pneumonia**	TMP-SMX 3.75–5 mg/kg body weight/dose TMP (based on TMP component) every 6 hours IV or orally given for 21 days (followed by secondary prophylaxis dosing)	If TMP-SMX-Intolerant or Clinical Treatment Failure After 5–7 Days of TMP-SMX Therapy *Pentamidine:* • 4 mg/kg body weight/dose IV/IM once daily is the first choice alternative regimen. **Note:** Pentamidine can be changed to atovaquone after 7–10 days IV therapy. *Atovaquone* *Daily Dosing:* • Children aged 1–3 months and >24 months–12 years: 30-40 mg/kg body weight/dose by mouth once daily with food • Children aged 4–24 months: 45 mg/kg body weight/dose by mouth once daily with food *Twice-Daily Dosing*:* • Children aged ≥13 years: 750 mg/dose by mouth twice daily *Some experts use twice-daily dosing of atovaquone as alternative treatment for PCP in children aged <12 years: • Children aged 1–3 months and >24 months to 12 years: 15–20 mg/kg body weight /dose by mouth twice daily with food • Children aged 4–24 months: 22.5 mg/kg body weight/dose by mouth twice daily with food.	After acute pneumonitis resolved in mild-moderate disease, IV TMP-SMX can be changed to oral. For oral administration, total daily dose of TMP-SMX can also be administered in 3 divided doses (every 8 hours). Dapsone 2 mg/kg body weight by mouth once daily (maximum 100 mg/day) **plus** trimethoprim 5 mg/kg body weight by mouth every 8 hours has been used in adults but data in children are limited. Primaquine base 0.3 mg/kg body weight by mouth once daily (maximum 30 mg/day) **plus** clindamycin 10mg/kg body weight/ dose IV or by mouth (maximum 600 mg given IV and 300–450 mg given orally) every 6 hours has been used in adults, but data in children are not available. Indications for Corticosteroids: • PaO_2 <70 mm Hg at room air or alveolar-arterial oxygen gradient >35 mm Hg *Prednisone Dose:* • 1 mg/kg body weight/dose by mouth twice daily for 5 days, then • 0.5–1 mg/kg body weight/dose by mouth twice daily for 5 days, then • 0.5 mg/kg body weight by mouth once daily for days 11 to 21. Alternative Corticosteroid Regimens Include: • Adult dosage of prednisone: 40 mg/dose twice daily on days 1–5, 40 mg/dose once daily on days 6–10, 20 mg/dose once daily on days 11–21, and • Methylprednisolone IV 1 mg/kg/dose every 6 hours on days 1–7, 1 mg/kg/dose twice daily on days 8–9, 0.5 mg/kg/dose twice daily on days 10 and 11, and 1 mg/kg/dose once daily on days 12–16. Chronic suppressive therapy (secondary prophylaxis) with TMP/SMX is recommended in children and adults following initial therapy (see Secondary Prophylaxis).	November 6, 2013

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed
Syphilis	Congenital *Proven or Highly Probable Disease:* • Aqueous crystalline penicillin G 100,000–150,000 units/kg body weight per day, administered as 50,000 units/kg body weight per dose IV every 12 hours for the first 7 days of life, and then every 8 hours for 10 days • If diagnosed after 1 month of age, aqueous penicillin G 200,000–300,000 unit/kg body weight per day, administered as 50,000 units/kg body weight per dose IV every 4–6 hours (maximum 18–24 million units per day) for 10 days *Possible Disease:* • Treatment options are influenced by several factors, including maternal treatment, titer, and response to therapy; and infant physical exam, titer, and test results. Scenarios that include variations of these factors are described and treatment recommendations are provided in detail on pages 36–37 of the Centers for Disease Control STD Treatment Guidelines, 2010. Acquired: *Early Stage (Primary, Secondary, Early Latent):* • Benzathine penicillin 50,000 units/kg body weight (maximum 2.4 million units) IM for 1 dose *Late Latent:* • Benzathine penicillin 50,000 units/kg body weight (maximum 2.4 million units) IM once weekly for 3 doses *Neurosyphilis (Including Ocular):* • Aqueous penicillin G 200,000–300,000 units/kg body weight per day administered as 50,000 units/kg body weight per dose IV every 4–6 hours (maximum 18–24 million units per day) for 10–14 days	Congenital *Proven or Highly Probable Disease (Less Desirable if CNS Involvement):* • Procaine penicillin G 50,000 units/kg body weight IM once daily for 10 days *Possible Disease:* • Treatment options are influenced by several factors, including maternal treatment, titer, and response to therapy; and infant physical exam, titer, and test results. Scenarios that include variations of these factors are described and treatment recommendations are provided in detail on pages 36–37 of the Centers for Disease Control STD Treatment Guidelines, 2010.	For treatment of congenital syphilis, repeat the entire course of treatment if >1 day of treatment is missed. Examinations and serologic testing for children with congenital syphilis should occur every 2–3 months until the test becomes non-reactive or there is a fourfold decrease in titer. Children with increasing titers or persistently positive titers (even if low levels) at ages 6–12 months should be evaluated and considered for re-treatment. In the setting of maternal and possible infant HIV infection, the more conservative choices among scenario-specific treatment options may be preferable. Children and adolescents with acquired syphilis should have clinical and serologic response monitored at 3, 6, 9, 12, and 24 months after therapy.	November 6, 2013

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed
Toxoplasmosis	Congenital Toxoplasmosis: • Pyrimethamine loading dose—2 mg/kg body weight by mouth once daily for 2 days, then 1 mg/kg body weight by mouth once daily for 2–6 months, then 1 mg/kg body weight by mouth 3 times weekly, **plus** • Leucovorin (folinic acid) 10 mg by mouth or IM with each dose of pyrimethamine, **plus** • Sulfadiazine 50 mg/kg body weight by mouth twice daily *Treatment Duration:* • 12 months Acquired Toxoplasmosis *Acute Induction Therapy (Followed by Chronic Suppressive Therapy):* • Pyrimethamine: loading dose—2 mg/kg body weight (maximum 50 mg) by mouth once daily for 3 days, then 1 mg/kg body weight (maximum 25 mg) by mouth once daily, plus • Sulfadiazine 25–50 mg/kg body weight (maximum 1–1.5 g/dose) by mouth per dose 4 times daily, plus • Leucovorin 10–25 mg by mouth once daily, followed by chronic suppressive therapy Treatment Duration (Followed by Chronic Suppressive Therapy): • ≥6 weeks (longer duration if clinical or radiologic disease is extensive or response in incomplete at 6 weeks)	For Sulfonamide-Intolerant Patients: • Clindamycin 5–7.5 mg/kg body weight (maximum 600 mg/dose) by mouth or IV per dose given 4 times a day can be substituted for sulfadiazine combined with pyrimethamine and leucovorin	Congenital Toxoplasmosis: • For infants born to mothers with symptomatic *Toxoplasma* infection during pregnancy, empiric therapy of the newborn should be strongly considered irrespective of the mother's treatment during pregnancy. Acquired Toxoplasmosis: • Pyrimethamine use requires CBC monitoring at least weekly while on daily dosing and at least monthly while on less than daily dosing. • TMP-SMX—TMP 5 mg/kg body weight plus SMX 25 mg/kg body weight per dose IV or by mouth given twice daily has been used as an alternative to pyrimethamine-sulfadiazine in adults, but has not been studied in children. • Atovaquone (for adults, 1.5 g by mouth twice daily—double the prophylaxis dose) in regimens combined with pyrimethamine/leucovorin, with sulfadiazine alone, or as a single agent in patients intolerant to both pyrimethamine and sulfadiazine, has been used in adults, but these regimens have not been studied in children. • Azithromycin (for adults, 900–1,200 mg/day, corresponding to 20 mg/kg/day in children) has also been used in adults combined with pyrimethamine-sulfadiazine, but has not been studied in children. • Corticosteroids (e.g., prednisone, dexamethasone) have been used in children with CNS disease when CSF protein is very elevated (>1,000 mg/dL) or there are focal lesions with significant mass effects, with discontinuation as soon as clinically feasible. • Anticonvulsants should be administered to patients with a history of seizures and continued through the acute treatment; but should not be used prophylactically.	November 6, 2013

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Indication	First Choice	Alternative	Comments/Special Issues	Last Reviewed
Varicella-Zoster Virus (VZV)	Chickenpox *Children with No or Moderate Immune Suppression (CDC Immunologic Categories 1 and 2) and Mild Varicella Disease:* • Acyclovir 20 mg/kg body weight/dose by mouth (max 800 mg/dose) QID for 7–10 days and until no new lesions for 48 hours *Children with Severe Immune Suppression (CDC Immunologic Category 3):* • Acyclovir 10 mg/kg body weight 500 mg/m^2/dose IV every 8 hours for 7–10 days and until no new lesions for 48 hours Zoster *Children with Uncomplicated Zoster:* • Acyclovir 20 mg/kg body weight/dose (max 800 mg/dose) by mouth QID for 7–10 days. *Children with Severe Immunosuppression (CDC Immunologic Category 3), Trigeminal or Sacral Nerve Involvement, Extensive Multidermatomal, or Disseminated Zoster:* • Acyclovir 10 mg/kg body weight/dose IV every 8 hours until cutaneous lesions and visceral disease are clearly resolving, then can switch to acyclovir by mouth to complete a 10- to 14-day course *Children with Progressive Outer Retinal Necrosis:* • Ganciclovir 5 mg/kg body weight/dose IV every 12 hours, **plus** • foscarnet 90 mg/kg body weight/dose IV) every 12 hours, **plus** • ganciclovir 2 mg/0.05 mL intravitreal twice weekly and/or foscarnet 1.2 mg/0.05 mL intravitreal twice weekly *Children with ARN:* • Acyclovir 10–15 mg/kg body weight/dose IV every 8 hours daily for 10–14 days, **followed by** Oral valacyclovir 1 g/dose TID for 4–6 weeks (for children old enough to receive adult dose). Alternative oral acyclovir dose: 20 mg/kg body weight/dose QID for 4–6 weeks	Patients Unresponsive to Acyclovir: • Foscarnet (40–60 mg/kg body weight/dose IV every 8 hours) for 7-10 days or until no new lesions have appeared for 48 hours	In children ≥1 year of age, some experts base IV acyclovir dosing on body surface area (500 mg/m^2 body surface area/dose IV every 8 hours) instead of body weight. Valacyclovir is approved for use in adults and adolescents with zoster at 1 g/dose by mouth TID for 7 days; the same dose has been used for varicella infections. Data on dosing in children are limited and there is no pediatric preparation, although 500 mg capsules can be extemporaneously compounded to make a suspension to administer 20 mg/kg body weight/dose (maximum dose 1 g) given TID (see prescribing information). Famciclovir is approved for use in adults and adolescents with zoster at 500 mg/dose by mouth TID for 7 days; the same dose has been used for varicella infections. There is no pediatric preparation and data on dosing in children are limited; can be used by adolescents able to receive adult dosing. Involvement of an ophthalmologist with experience in managing herpes zoster ophthalmicus and its complications in children is strongly recommended when ocular involvement is evident. Optimal management of PORN has not been defined.	November 6, 2013

Key to Acronyms: LIP = lymphocytic interstitial pneumonia; PCP = pneumocystis jirovecii pneumonia; IV = intravenous; PK = pharmacokinetic; CSF = cerebrospinal fluid; CNS = central nervous system; ICP = intracranial pressure; cART = combination antiretroviral therapy; ART = antiretroviral therapy; BSA = body surface area; CrCl = (estimated) creatinine clearance; HBV = hepatitis B virus; SQ = subcutaneous; HCV = hepatitis C virus; IFN- = interferon-alfa; BID = twice daily; TID = three times daily; QID = four times daily; CNS = central nervous system; CSF = cerebrospinal fluid; HSV = herpes simplex virus; PCR = polymerase chain reaction; BCA = bichloroacetic acid; IFN = interferon; TCA = trichloroacetic acid; TMP-SMX = trimethoprim-sulfamethoxazole; DOT = directly observed therapy; IGRA = interferon-gamma release assay; IM = intramuscular; TB = tuberculosis; IRIS = immune reconstitution inflammatory syndrome; TE = toxoplasmic encephalitis